MICHIGAN ENVIRONMENTAL SCIENCE BOARD

LOW LEVEL RADIOACTIVE WASTE PANEL
MEETING SUMMARY
TUESDAY, DECEMBER 12, 1995
PARK INN INTERNATIONAL
HOWELL, MICHIGAN

PANEL MEMBERS PRESENT
Dr. Lawrence Fischer, Chair
Dr. David Long
Dr. David Morrissey
Dr. Conrad Nagle
Mr. Keith Harrison, Executive Director

DMB\EAD SUPPORT STAFF PRESENT
Mr. Jesse Harrold, Environmental Officer
Ms. Patricia Hiner, Secretary

I. CALL TO ORDER

Dr. Lawrence Fischer, Chair, called the meeting of the Low Level Radioactive Waste Panel to order at 9:00 a.m. Dr. Fischer announced that both Dr. Premo and Mr. Carey had encountered weather related transportation problems and could not attend the meeting.

II. EXECUTIVE DIRECTOR'S REPORT

Mr. Harrison distributed a copy of the federal siting standards for the licensing process for low level radioactive waste facility applications. He announced that the staff have contacted all the people suggested as speakers, and although some were not available for this meeting, they may be available later. Roland Bannister, of British Nuclear Fuels, had been scheduled for today's meeting, but was unable to attend as planned. Mr. Harrison also distributed a copy of the Panel's most recent listing of articles submitted for review.

III. PUBLIC COMMENT

Ms. Terry Gill, Michigan Low Level Radioactive Waste Authority, asked Mr. John MacMillan, Executive Director of the North Carolina Low Level Radioactive Waste Management Authority, and one of the presenters, to comment on some specific regulations concerning a specific site in North Carolina. According to her, 10CFR61 Section 5811 requires that a candidate site should not be located near facilities that could adversely affect the ability of the site to meet performance objectives or that could mask the site's monitoring program. She understood that in North Carolina one of the

sites was located near a nuclear power plant and the local county took legal action. Mr. MacMillan responded that North Carolina did, in fact, select a preferred site adjacent to the Sharon Harris Nuclear Power Plant. Their contractor looked carefully at whether activities at the power plant could mask the ability to monitor the site and concluded that there was no potential impact. Public comment had originally suggested that sites adjacent to power plants be given consideration in the siting process, and this was incorporated into the North Carolina rules. That particular rule has not been challenged in court.

Ms. Gill went on to ask that the MESB's public comment period be moved to the end of the agenda in the future, so the public can respond to speakers. Dr. Fischer explained that the function of the MESB public comment period is to allow the public to convey information to the Panel, not to ask questions of the speakers. The Panel needs to use its limited time to collect as much scientific information as possible in order to make an informed recommendation to the Governor. All public comment will be considered, but the MESB asks that it be submitted in writing if possible.

IV. PRESENTATIONS

Mr. John MacMillan, Executive Director of the North Carolina Low Level Radioactive Waste Management Authority, presented background information on North Carolina's experience in siting a LLRW facility. A summary of his presentation is contained in Attachment 1.

Dr. Morrissey asked how large the Southeast Compact was and how many potential generators exist for North Carolina. Mr. MacMillan answered that the Compact has seven member states after the withdrawal of South Carolina. There are 33 nuclear power plants in the southeast, and 300 to 400 generators, with annual LLRW volume of 250 to 300 thousand cubic feet. Since the departure of South Carolina, there has been no regional facility. Last year South Carolina opened the Barnwell facility to all generators except North Carolina.

Dr. Long asked Mr. MacMillan to discuss the 594 interrogatories he referred to in his presentation. He indicated that they were questions developed by the 10 to 15 North Carolina regulatory agencies that reviewed the license application. The lead organization was the Division of Radiation Protection, which involved the North Carolina geological, epidemiological and forestry departments, each reviewing the portion of the application within their own area. The Division of Radiation Protection then compiled the questions and requests for further information and forwarded them to Chem-Nuclear. It is this division that will actually be the licensee, and Chem-Nuclear will operate the facility under the direction of the North Carolina LLRW Authority.

Dr. Fischer asked if the federal government has reviewed the application. Mr. MacMillan answered that it had not, because the state of North Carolina decided to incorporate 10CFR61 into their regulations, with the addition of some features specific

to the state, so there is no federal review or participation by the U.S. Nuclear Regulatory Commission (USNRC).

Dr. Fischer asked Mr. MacMillan for a summary of special criteria developed by the state. Mr. MacMillan listed several. North Carolina's Radiation Protection Act incorporated a prohibition against shallow land burial, and a requirement for engineered barriers to keep waste from contact with adjacent soils. There was much concern about water, since it is generally thought that the dominant avenue or pathway to exposure of the general public is through the groundwater. A significant part of the state was eliminated with the rule that seasonal groundwater may be no closer to the surface than seven feet. North Carolina also required that there could be no water supply within 1,000 feet of the waste. To be sure this requirement is met, the Authority acquired enough property to assure that no private development would take place within that distance. As a further protection, only solidified waste will be accepted at the facility.

Dr. Nagle asked how the thousand foot standard was derived. Mr. MacMillan answered that it seems to have been arbitrary. Mr. Harrison asked how the relationship between groundwater and waste had been established. Mr. MacMillan responded that groundwater dynamics is one of the things researched during the siting process. The intent is not to allow the groundwater to enter the waste during the winter when the table is high, then melt out in the summer and enter the water supply. There is still a lot of work to be done on this area.

Dr. Long asked whether the Wade County site is in the Piedmont. Mr. MacMillan explained that it is in the eastern Piedmont; the Triassic basin - west of the Jonesboro fault, and is composed of mudstone and sandstone, highly fractured, with some intrusive dikes nearby. The LLRW Authority dealt extensively with the question of predicting water flow. The site has very low water and infiltration rates, about 40 inches of rain that runs off on the surface. Pumping tests also have been done there. In performance assessment, the state is required to use the same radiation standards as in 10CFR61; 25-75-25 millirem at the boundaries. The standard for the intruder dose is less clear, so they have settled on 100 millirem for the intruder dose scenario.

Dr. Fischer asked about the population centers near the North Carolina site. Mr. MacMillan said that the nearest town is 10 to 12 miles away, and Raleigh, a large metropolitan area is about 20 miles away. Wade County itself is home to several large waste generators, including the Sharon Harris and Brunswick nuclear plants, General Electric and the U.S. Environmental Protection Agency. No one lives on the site because of its peculiar geology.

Dr. Nagel asked how the configuration of the vaults was determined and whether the facility, when finally capped, will be above or below ground. Mr. MacMillan said that Chem-Nuclear considers it above grade. The three foot floor of the vaults will be poured at grade, and the vaults will be 30 feet high, made of three-foot reinforced concrete. There is a drain in each vault which is part of the monitoring system. The radioactive material is placed in the containers and put into the vault until the spaces

are filled. The three-foot roof is poured and the outside is waterproofed. There is an engineered cap put over the top to keep rainfall away from the facility. After 20 years and a million cubic feet of waste, there will be four long furrows covered with soil and grass. The Illinois facility will be more obviously above ground, with trucks able to drive in to unload waste.

Dr. Nagle asked whether a facility is required to take government waste. Mr. MacMillan answered that most government waste qualifies as commercial low level radioactive waste, with the exception of that generated by the U.S. Department of Energy.

Dr. Morrissey asked whether North Carolina had begun storing waste from the decommissioning of nuclear reactors. Mr. MacMillan said they have not and explained that in the Southeast Compact, each host state runs for 20 years or until a site accumulates 32 million cubic feet. Since they will never reach that volume, it is really a 20 year tenure. There are some plants whose licenses will expire during that time. North Carolina has looked at the waste likely to result from some decommissioning and that associated with facility upgrading for plant life extensions. The state does not know yet the character or magnitude of the waste that will result from decommissioning. Authoritative studies indicate that the final waste volume will be about 100,000 cubic feet. In the North Carolina inventory, they have used the plant life extension inventory, including the ongoing operating waste on the nuclear power plants, then designed the facility for about 50% higher total inventory than was projected. They have projected that for 20 years, there will be about seven million cubic feet of waste to store. The facility is being designed for 11 million cubic feet, making for about a 50% contingency. Dr. Morrissey expressed surprise that there would be so few decommissionings, when Michigan will have one out of four in the next several years. Mr. MacMillan replied that there are a third expiring in the 20 year period, with most during the last five years. There also will be a “cool-down” period for those that do not get extensions, so there will not be that much waste to deal with all at once.

Mr. Paul Corpstein, General Manager of Site Development for Chem-Nuclear, presented an overview of the Illinois Low-Level Radioactive Waste (LLRW) Isolation Facility design concept. Chem-Nuclear is the contractor for both the states of Illinois and North Carolina. A summary of his presentation is contained in Attachment 2.

Dr. Long asked Mr. Corpstein why, given the scientific and technological expertise of the state of Illinois, Chem-Nuclear was hired to make the choice for the site. His experience was that the public would be more likely to trust the state than a private contractor. Mr. Corpstein answered that in a previous process, the state of Illinois selected a site at Martinsville and could not do it without letting politics get involved. There was a sense that the state could not do it fairly. Not only was an independent contractor hired for the new process, but the scientific surveys were also added. These have had great credibility with the public. Dr. Nagle asked how this process compared with the North Carolina process. Mr. Corpstein said that Basco, an engineering firm, selected a series of sites it thought might be suitable, then turned the information over

to Chem-Nuclear, which eliminated two of the four, and characterized two. One site fell out due to political pressure.

Dr. Fischer asked who supplies the standardized transport liners. Mr. Corpstein said that there are several manufacturers. The liners and overpacks come in different geometric shapes that cover the most widely used waste forms.

Dr. Nagle asked if the absorbent interstitial material put between waste packages in the disposal unit was a costly way of storage. Mr. Corpstein indicated that it was. He stated that the regulations require that void spaces around the packages be filled to allow free drainage. They will be using pea gravel. Dr. Nagle asked whether, during the active phase of storage, there is a cap over the modules. Mr. Corpstein said it will be a partial cap. Compacted backfill will extend all the way across the top of the disposal modules as soon as they are built. A non-engineered cap is placed across the top.

Mr. Jesse Harrold (DMB/EAD staff) asked if there is anything put between the module and the overlying roof to support the roof. Mr. Corpstein answered that since the expanse of the roof is so large (30 feet by 60 feet), inside each disposal module there are six support columns, and as each module is filled, columns will be added. The columns should provide all the support that is needed for the year life of the facility.

Dr. Fischer requested that Mr. Corpstein provide the Panel with information addressing the issues of public safety, prevention of accidental exposures, worker safety and how geological catastrophic and remote incident events would be handled. Mr. Corpstein indicated that he could provide that information.

Dr. Nagle asked how the LLRW sites employees were classified in respect to waste exposure and if there is a radiation safety officer. Mr. Corpstein stated that Chem-Nuclear is umbrella covered on liability, even to unnecessary or negligent exposures of employees. ALARA (as low as reasonably achievable) radiation exposure is the policy of Chem-Nuclear and this policy is prevalent throughout the industry. Chem-Nuclear facilities are over designed which results in above standard protection of the workers and the environment. A 100% health physics program is run on all persons working at a facility for both exposure to radiation and accumulation of radionuclides. Of the approximate 100 persons employed at the site, 16 to 20 badged workers would be allowed in the restricted area where an increased risk of exposure may occur. The most remote and the most catastrophic events and combinations thereof are all considered and are required in the USNRC licensing process. The industrial accident evaluation and licensing are handled by the states of North Carolina and Illinois.

Mr. Harrison inquired what cover sealing procedures and materials would be used in a LLRW waste site closure and how would the year to year maintenance be executed. Mr. Corpstein replied that the entire engineered structure would be capped with a minimum of two feet of compacted impermeable clay to a runoff contour. This would result in a clay layer approximating 26 feet thick at some points on the current design.

The clay cap would be covered with a 60 mill textured film and then topped with two feet of subsoil dressed with topsoil to accommodate grass growth. The site would then be maintained under contract to the construction company for seven to 10 years after closure, then the site goes to institutional control. The institutional manager, which would probably be the state, is entrusted for the next 100 years to cut the grass, remove brush and trees, maintain the boundary fence, collect samples and keep intruders out. It is a presumption that the state will hold fee simple deed and, have full control of the closed facility.

Dr. Nagle asked Mr. Corpstein if there are special circumstances which Michigan needs to attend to in site location. Mr. Corpstein answered that every proposed site Chem-Nuclear has looked at requires special considerations and criteria. Criteria should be site specific rather than generalized especially when dealing with hydrology. However, and having stated that, one criterion which always requires special treatment is wetlands. An area may be classified as a wetland on the basis of conditions which may seem obscure to many. Mitigation appears to be the solution to the wetland problem when it occurs. A high water table does not create an infiltration problem as long as the facility is above ground.

Dr. Nagle commented that one of the problems with the Michigan criteria was the arbitrary nature of the numbers presented. Mr. Corpstein stated that the numbers in the Illinois criteria were also based largely on politics and public conscience. While scientific data played little in the Illinois final numbers, it may have kept them within reason. He did not believe that science-based numbers have any status with the public and that politically compromised numbers would be the only numbers that would survive. Dr. Long disagreed, stating that science could develop justifiable and publicly acceptable numbers, for instance, ground water movement measurements and a time and travel scenario for radionuclides decay rate, so that a point of containment could be measured in linear feet from the point of disposition.

Mr. Dave Minnaar (Michigan Department of Public Health) stated that the true basis for any criterion should be dose limits, since health and safety risk is summed up in dose limits.

Dr. Morrissey asked Mr. Corpstein to provide a comparison of the Illinois and North Carolina criteria to the federal performance standards. Mr. Harrison added that the Panel was basically interested in those criteria which exceeded the federal standards. Mr. Corpstein indicated that he could provide the requested information sometime after January 18, 1996.

V. PANEL DISCUSSION

Dr. Fischer presented the option that an engineered facility be constructed or let the waste pile up at the 50 odd sites in Michigan. Dr. Morrissey commented that if a survey of the sites was conducted that some rather high risks might be found. Mr. Minnaar indicated that the USNRC looks at each of the storage sites once every five years. Dr.

Nagle suggested that the Panel might want to also look at the USNRC criteria for the storage sites. He asked Dr. Fischer if Michigan State University's radiation safety officer could provide and explain the criteria which applies to the University's repository. Dr. Long requested that a map of the 50 sites be located on a Michigan map to help clarify the situation.

Dr. Fischer and Dr. Long brought up the concern regarding the integrity of an engineered LLRW disposal facility in 100 years or 500 years and the exposure level to an intruder living near by or in it, or drinking water that has passed through a crack in the facility cell. Dr. Morrissey indicated that he might be able to generate an exposure number, but needed to know the LLRW matrix and would need some expert assistance. Other questions included, what would be the exposure of a person standing next to an overpack filled with type C radioactive waste and what would be the exposure to employees working in the corridors of the LLRW disposal facility.

VI. PANEL ASSIGNMENTS

At the December 12, 1995 Low-Level Radioactive Waste Panel meeting, the below listed charges from Governor Engler's July 26, 1995 letter were tentatively assigned to the designated Panel members for response.

A. Evaluate whether Michigan's environment and/or geology pose unusual or unique conditions that would not be fully recognized, evaluated and protected under federal siting regulations contained in 10 CFR 61 and the Nuclear Regulatory Commission's standards for performance-assessment studies (Long, Morrissey & Harrison).

B. Given your assessment of the protections afforded by federal siting and performance standard, and your review of any unique environmental conditions found in Michigan, are any of Michigan's statutory siting criteria unwarranted (All Panel Members).

C. In the judgment of the MESB, can an engineered LLRW isolation facility be located in Michigan without posing dangerous levels of radioactive risk to public health and safety and/or the environment (Carey).

D. Evaluate the relative risks associated with locating a centralized LLRW isolation facility in Michigan (Nagle and Premo).

E. In conducting this evaluation, please consider the relative risk of LLRW in the July 1992 report entitled, Michigan's Environmental and Relative Risk (Nagle and Premo).

F. Consider the relative risk of developing an engineered, centralized waste-isolation facility with the risk of doing nothing; i.e., continuing to store LLRW at the approximately 50 existing locations (Morrissey).

G. All introductory, references cited, and other similar sections (Harrison).

In addition to the above, an assignment was made to Long, Morrissey and Harrison to develop a matrix comparing federal performance and siting criteria with siting criteria from Michigan, Pennsylvania, Illinois, North Carolina, Nebraska and Texas.

Dr. Fischer announced he would be on sabbatical, however he would be available by mail for review of and comment on the report. Dr. Bette Premo would serve as Panel Chair in his absence.

VII. NEXT MEETING DATE

No date was set for the next meeting of the Panel. Mr. Harrison indicated that his office would poll the Panel members on the best date for everyone.

VIII. ADJOURNMENT

The meeting was adjourned at 3:15 p.m.

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ATTACHMENT 1. Presentation by Mr. John MacMillan, North Carolina Low Level Radioactive Waste Management Authority.

The North Carolina Low Level Radioactive Waste Authority (Authority) was established in 1987, after North Carolina became the second state in the Southeast Compact. The Barnwell facility in South Carolina was the regional facility for that Compact (until June 1995). The Authority consists of 15 citizen members, five each appointed by the Governor, Lt. Governor, and Speaker of the House. The Authority is responsible for finding, designing, building, operating, and closing the site, and maintaining site surveillance for at least 100 years after closure. The rulemaking process was completed in 1988. Two sites were characterized and the preferred site was selected in 1993. Chem-Nuclear was selected as the contractor through competitive bidding in 1989. It was selected because of the company's outstanding record at Barnwell, where it was willing to provide strict liability and had had no release of radioactivity beyond the licensed limit. Chem-Nuclear completed the site selection, screening, and characterization, and submitted a 10,000 page license application to state regulators in December 1993. The selected site is in the southwest corner of Wade County, about 20 miles southwest of the city of Raleigh.

The initial review began in January 1994, after North Carolina regulatory agency review determined that the application was complete. The first round of interrogatories, totaling 594, was received from March through August of 1994. Some of these required additional field work and some additional analytical work, including a revised approach to the performance assessment methodology. Chem-Nuclear is still responding to the first round of interrogatories and the license has not yet been issued.

The current situation in North Carolina is somewhat tenuous. Funding has primarily come from generators in the southeast and from surcharges or access fees paid at Barnwell which were used to support the North Carolina process. When South Carolina withdrew from the pact in June 1995, that revenue disappeared. The Southeast Compact currently has reserve funds of about 30 million dollars with which to complete the licensing project and meet other obligations. In spite of the problems, the comprehensive site assessment is nearly completed. In terms of the performance assessment, Mr. MacMillan explained that the North Carolina approach is somewhat different from that outlined by the USNRC and is based on the state's own experience.

His first recommended guideline would be to keep the performance assessment simple so that it can be explained to the public and understood by informed lay people. The current approach is very scientific, very elegant and sophisticated, but difficult to explain. The second recommended guideline is to remember that water is the enemy of waste, the standard adopted in North Carolina. Examination of water in the pathway will be the most time consuming part of the analysis. North Carolina has depended to a great degree on the waste form as a means of isolating it from the environment. This is better protection for the public and minimizes the dependence on the site to perform an isolation function. If water cannot come in contact with the waste in the first place,

there is no need for the site to reduce the dose from the edge of the disposal area to the border. The intruder dose could be met right at the point where the water is discharged from the facility itself and would not depend on site characteristics to lower the dose.

At the facility, waste will be received only in solid form. It will be put into multi-use, high-integrity containers, which have already been accepted by the USNRC for national use. The USNRC has accepted their use for up to 300 years, but Chem-Nuclear says they will maintain their integrity for 500. These containers are not engineered barriers themselves, but are put into large vaults, three feet thick and 90 feet x 90 feet x 30 feet, called disposal modules. After the modules are full, the interstices are filled with gravel and a concrete slab is poured over the top, making the modules completely waterproof. The method is patterned after the facility at L'Aube, France.

The first part of any assessment process is the waste inventory. In the case of North Carolina, Chem-Nuclear has looked at historic disposal data from Barnwell from 1989 through 1994, in terms of kinds of waste, quantity, and the elements or isotopes involved. Projections made by the generators themselves proved to be overestimates and not good for estimating the future waste stream. The volume of material coming in is only about a third what it was 10 years ago. Over 90% of the waste is type A, and about 50% of that comes from nuclear power plants, where most of the waste is type A. Almost all the type C waste also comes from nuclear power plants. Ninety-five percent of the total radioactivity that is disposed of each year comes from nuclear power plants. Industry contributes approximately 30% to 40% of the volume. Commercial fuel reactors contribute a fair amount. There is also waste from pharmaceutical companies and agribusiness research. The U.S. government accounts for between 5% and 10% of the waste (Fort Bragg hospital waste, shipyards and other waste from military bases). Less than 2% of waste comes from institutions, research, laboratories or hospitals. Nuclear medicine materials generally decay very quickly, so are a minor component. Long-lived waste, like carbon 14 and tritium, must be solid before disposal. It is usually made into concrete so the tritium is held there. Sometimes it can be evaporated or consolidated. There are acceptance criteria that define in what form waste can be received.

Waste will be transported by normal routes to the LLRW site, then put into the multi-use, high-integrity containers which are filled, sealed with a polyethylene cap, welded closed at the top and concrete grout placed on top of that. There is no requirement that waste be compacted, but since generators are charged by volume, there is an economic incentive to compact. Chem-Nuclear's performance assessment shows no release of any radioactive material for the first 500 years. In assessing performance after that time, they decided that instead of performing a complex analysis of concrete fractures, waste, fusion and corrosion, which would be hard to substantiate in any case, to make the very conservative and straightforward assumption that at year 500 all the waste within the module, including the multi-use, high-intensity containers, is immediately ground into homogenous rubble, and, with the exception of the metallic compost, is all accessible to water. Everything is exposed. For the metallic components

they assume that the release of the induced radioactivity will be controlled by the corrosion rate of stainless steel. Otherwise they assume that all the waste is accessible for leaching. Chem-Nuclear does not believe that that is a realistic assumption. They believe there will be very little water and waste available for leaching. But making the most conservative assumption, that saturated conditions prevail, they then looked at the distribution coefficient, K_d, between the solid waste and the water for each isotope involved in the waste. The environment, with a large component of cement, will have high pH conditions, probably over 10. There is extensive and credible literature on the K_d values making it possible to make good estimates of the concentration of isotopes in the water in exposed areas.

Another important issue in the assessment is transport. How does whatever comes out of the disposal units get into the environment and get transported to a receptor at the boundary of the facility? This will involve analysis of pollution dispersion, retardation due to the chemical constituents of the environment, the unsaturated flow from the base of the disposal unit through the ground, and flow through the water table itself. Currently Chem-Nuclear is assuming instantaneous transport from the facility to the water table, then to the boundary. They will not be able to analyze the receptor dose at the boundary until they have completed a satisfactory groundwater flow model.

The intruder dose analysis is more complete. While the disposal units are intact, not enough water will infiltrate to provide drinking water to sustain one person, so there will be no problem. After 500 years, a deteriorated cap will allow 1.2 inches of water per year. That 1.2 inches will contain the concentrated waste, but will not be enough for human survival, so will have to be diluted with water from other sources. Exposure of 10 millirems to 20 millirems per year would result if an intruder drinks the 7,700 cubic feet of water necessary for survival, which meets the intruder dose requirement. There is little dependence on the site itself to lower the dose from the source to the boundary. In fact, the buffer zone is determined not by the dose determination boundary, but rather by travel time. This allows sufficient time for any unexpected release to be detected and remediated before it reaches the boundary. That time may be different on each side, depending on the groundwater dynamics. It is unlikely that anyone could drill directly through the vaults for water, but in any case would get none. Some waste would be released in the process, but the intruder scenario is not based on that possibility, only on the possibility of an adjacent groundwater well.

Chem-Nuclear is extending the projected life of multi-use, high-integrity containers for Cesium 137 from 300 years to 400 years, since the Cesium 137 has a 30 year half-life of about 300, then it is no longer a problem. Beyond 500 years, when the assessment has the waste rubblized, 40% to 50 % of the dose for the intruder scenario comes from Iodine 129. There are some problem isotopes in the Southeast, however, like radium, which is mostly from industrial generators, and uranium, which is used for weapons. The state will probably put limits on the quantity of radium or demand that it be put into a special waste form so it cannot seep into the environment. It would not be part of the rubblized waste analysis. The scrap material from uranium is LLRW and will not be a problem in the first 1,000 years, but after a million it can become a problem. However,

the concentration is no higher than certain natural deposits of phosphates in the mountains of North Carolina. Chem-Nuclear is still working on that.

The USNRC has a draft branch technical paper in circulation, though it may never be published, outlining methodology sometimes referred to as the 'USNRC approach". Chem-Nuclear, is concerned that it is too complicated and confusing and open to misinterpretation. A range of parameters is entered into a computer program and the user tries to decide what the distribution of those parameters will be. Calculations are made by a number of different methods, resulting in a distribution of projected dose rates from all of the combinations and permutations. The user then decides which outcomes are unrealistic. Chem-Nuclear uses the method of making conservative and simple assumptions, and if the results are acceptable, there is a margin for error. Conventional probabilistic risk assessments are probably not very useful, in that there are no historical statistics in existence for waste storage. But they can help in understanding the parameters that can effect the projected dose. Comparative risk assessments may be very useful in public information, to give a sense of perspective.

ATTACHMENT 2. Presentation by Mr. Paul Corpstein, Chem-Nuclear Systems.

Chem-Nuclear has been contracted to oversee the siting process, provide instructional services, operate, and close the LLRW facility that will be located in Illinois. The company is performing similar functions for North Carolina and Pennsylvania.

The Illinois LLRW Task Group is composed of nine appointed members. Three are the directors of the Illinois Department of Nuclear Safety, Illinois Department of Natural Resources, and Illinois Environmental Protection Agency. All the results go to the Governor and General Assembly. Local government is involved in the statewide screening and the site selection process in that they can volunteer sites and participate in the development of siting criteria. The public has open access to the process at any time. There have been five special meetings and two public hearings around the state. Chem-Nuclear is the contractor that will select the site out of a number that have been scientifically screened by the Illinois Geological Survey and the Illinois Water Survey. The surveys will provide at least ten locations in the state that appear likely to meet the criteria, plus any volunteer sites. Chem-Nuclear will select three sites from among them, then select one for full characterization and license. Individuals and communities may volunteer land either prior to the scientific surveys or at the time the ten sites are turned over to Chem-Nuclear. Volunteered sites get preference if they meet the criteria.

The proposed Illinois LLRW facility design differs from that of the North Carolina facility only in that it is side loading rather than top-loading. Also, the Illinois facility is designed for a 50 year operation, while North Carolina is designed for 20 years. The same disposal modules are used in each. In the Illinois facility, new modules will be added at the ends of rows that are parallel to each other with a center aisle, through which the waste is carried. Supporting structures at the site include a visitor building and various containment facilities. The design is adaptable to multiple volumes and to various models.

Waste arrives over highways in transport casks or vans in V-25 boxes or 55-gallon drums directly from generators and brokers, already processed and in containers. It is transferred into the multi-use high-integrity containers with overhead cranes. The resulting package is filled with concrete grout to completely seal off the waste. There are remote handling capabilities and portable shield walls in the facility to reduce workers' contact with direct radiation. The building itself is shielded with 10 foot tilt-up steel walls along the inside. It is unlikely that the shielding will be needed because of the packaging and transport requirements, but it is available as a safety measure. The waste is packed in transport casks in commercially available liners and the liner and waste are removed from the casks as a unit and put directly into the vault. Once the waste package is placed inside the overpack, the multi-use, high integrity container, gravel is poured in to completely seal off the package. The overpacks are then grouted and the concrete grouting cured before the packages are picked up and transported to the disposal units. The overpacks are made from a fiber reinforced concrete. The

containers are certified for a 300 year life. The waste package, which consists of the waste itself, the material used to solidify or stabilize that material, plus the container that the material is in, plus the overpack, is then put into concrete side loaded disposal modules. Modules are added on as needed. The rows of disposal modules are covered with a non-engineered cap and sit on an engineered understructure. After the waste package is loaded into the disposal module, it is covered with concrete. The concrete is covered with a polymer coating that is a moisture and protective barrier, but it does not protect for freeze/thaw considerations. There will be a two foot thick layer of materials across the top.